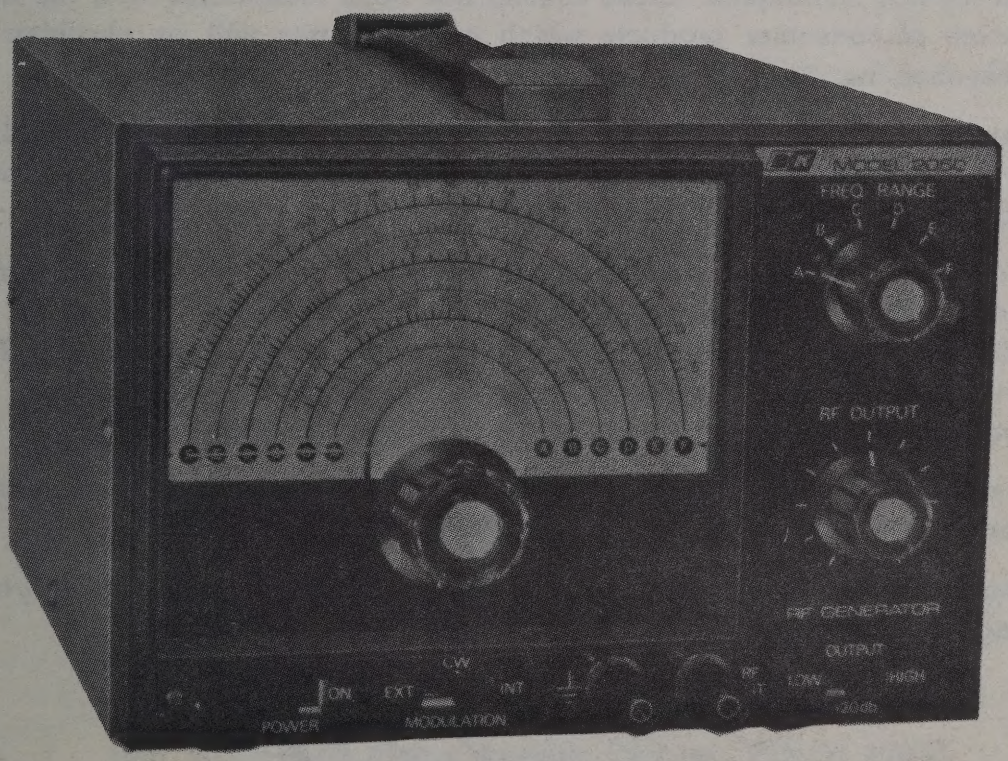
INSTRUCTION MANUAL

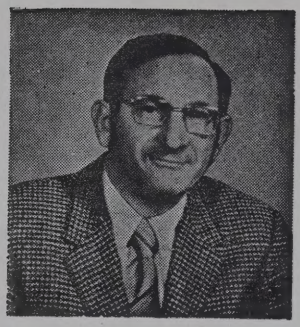
B&K Model 2050

RF SIGNAL GENERATOR



B&K

Product of DYNASCAN CORPORATION
1801 West Belle Plaine Avenue, Chicago, Illinois 60613



Dear Friend:

Congratulations on your purchase of B & K—Precision Test Equipment, and welcome to the B & K family. We hope your experience with your new test equipment will make you a lifetime B & K customer.

Your instrument is backed by more than 20 years of experience in designing and manufacturing. Our most important goal is your satisfaction. At B & K, test equipment is made to meet the demands of the field focusing on dependability and accuracy. We also concentrate on simplicity and operating ease with features that reduce the possibility of human error and speed the servicing process.

In order to determine the type of test units that are needed we have been guided by letters and reports from technicians and engineers who use the equipment daily. Our field tests and studies have helped provide better and faster service techniques. Close contact has been maintained with the manufacturers of consumer products which our test units will be checking and trouble-shooting.

Key personnel in our company cut their eye teeth in the TV service business. This is why we have more "sensitivity" for the problems and conditions under which the test equipment will be used.

B & K product designs are constantly reviewed, and refinements are made or new models developed to meet advances in our industry and to fill your needs. We set our standards high so you can be assured that the B & K test instruments you buy represent advanced design, quality construction, and dependable long-term performance at a price you can afford.

If you have any comments or thoughts about our products, or test equipment in general, I would be delighted to hear from you.

Thanks for your confidence in B & K and we look forward to serving you for a long time to come.

Sincerely,

Carl Korn
President

INSTRUCTION MANUAL

FOR

Model 2050

RF SIGNAL

GENERATOR

Product of DYNASCAN CORPORATION
1801 West Belle Plaine Avenue, Chicago, Illinois 60613

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FEATURES

- All solid-state construction.
- Compact, easy-to-read frequency scale with smooth mechanism.
- 100 kHz to 30 MHz frequency coverage in 6 ranges, each in different color on dial for quick, accurate readings.
- Output voltage of better than 0.1V rms, continuously variable to any desired magnitude through combined use of 20 dB (approximately 1/10) attenuator and RF OUTPUT control.
- Modulation is either internal (approximately 40% at 400 Hz) or external (50 Hz to 10 kHz)—selectable by MODULATION switch.
- High stability against supply voltage fluctuations.
- Convenient markings on dial plate for making adjustments and frequency checks in Amateur band, TV and AM receivers.

MODEL 2050

SPECIFICATIONS

Frequency Ranges	**Band**	**Frequency**
	A	100 kHz to 250 kHz
	B	250 kHz to 650 kHz
	C	550 kHz to 1.5 MHz
	D	1.5 MHz to 4 MHz
	E	4 MHz to 11 MHz
	F	10 MHz to 30 MHz
Frequency Accuracy	±1.5%	
Output Voltage	0.1V rms or better (20° C.)	
Attenuator	HIGH-LOW (provides approximately 20 dB change)	
Internal modulation frequency	Approximately 400 Hz	
Internal modulation level	40%, ±5%	
External modulation frequency	50 Hz to 10 kHz	
External modulation voltage	1.5V rms for 40% modulation	
Operating temperature	0 to 50° C.	
Power requirements	100V, 117V or 230V AC, +10%, 50/60 Hz (unit supplied for use on 117 V AC, 50/60 Hz line)	
Power consumption	2.8 watts	
Dimensions overall	7½ x 9-3/4 x 6-1/8 inches	
Weight	5 lb.	
Accessories	Shielded lead with insulated clip and banana plug; fuse; instruction manual.	

THEORY OF OPERATION

1. Outline. Please refer to the block diagram of Fig. 1 (P. 15).

The sine wave signal produced in the RF oscillator circuit is directly amplified by the modulated amplifier when the MODULATION switch is at CW, then passes the output attenuator, and appears at the output terminal. When the MODULATION switch is set to INT, the output can be internally modulated to approximately 40% at 400 Hz by sine wave signal from the AF oscillator circuit, or externally modulated when the switch is shifted to EXT. Required level of the modulating signal is more than 1.5V rms for 40% modulation at frequencies between 50 Hz and 10 kHz.

2. RF Oscillator Circuit. The RF oscillator circuit employs a Hartley circuit, the oscillating elements consisting of coils (FREQ. RANGE), which are switched in six ranges, and a variable capacitor (FREQUENCY dial), covering 2.5 times the lower edge of each range or a total range of 100 kHz to 30 MHz.

The amplifier circuit for the oscillator is a high input impedance circuit employing an FET and includes a feedback resistor for each range so that output may be equal in all ranges.

3. Modulated Amplifier. The signal from the RF oscillator circuit is amplified by Q2, passes the modulated amplifier (a gate-modulated type built around Q3), and then an RLC type low-pass filter before being taken out through an emitter follower, Q4.

4. AF Oscillator Circuit. Transistor Q5 forms an LC oscillator circuit, and its output is coupled to the modulated amplifier through VR1 (INT. MOD. ADJ.).

5. Power Supply. Input AC voltage (100V, 117V or 230V AC) is stepped down to a required voltage by the power transformer, rectified (full-wave) by rectifier D1, and passed through a smoothing circuit to obtain the DC voltage. This power supply section feeds 15V DC to all signal generator circuits as "B" voltage.

OPERATOR'S
CONTROLS AND PANEL INDICATORS

NOTE: This instrument is supplied for use on 117 V AC, 50/60 Hz lines. For 100 V AC or 230 V AC operation, please refer to the instructions under "PRECAUTIONS," on page 15 of this manual.

The 2050's controls and their functions are as follows (refer to EXTERNAL VIEW drawing on page 16):

FRONT PANEL

Ref. No.	Controls, Connectors, etc.	Description
(1)	(Neon lamp)	Lights up when POWER switch (2) is turned to ON.
(2)	POWER	Slide switch; turns power ON when set to right-hand position.
(3)	MODULATION	Selector switch for modulating signal.
	EXT	In this mode, output signal can be AM-modulated at any frequency between 50 Hz and 10 kHz when a modulating signal is fed to EXT MOD INPUT terminals (12) and (13).
	CW	This is the central position of the MODULATION switch, and produces unmodulated output.
	INT	Output is AM-modulated by the built-in AF oscillator to approximately 40% at 400 Hz.
(4)	⏚ (GND)	Grounding terminal.
(5)	RF OUT	Any output can be obtained from this output terminal.
(6)	OUTPUT = 20 dB	Output attenuator .
	HIGH	In this position, output is applied directly to the output terminal without attenuation.
	LOW	Gives an attenuation of approximately 20 dB.

Ref. No.	Controls, Connectors, etc.	Description
(7)	RF OUTPUT	Permits changing output voltage continuously between 0 and 0.1 V rms.
(8)	FREQ. RANGE A: B: C: D: E: F:	Used to select frequency ranges indicated on scale (10) and pointer (11) as follows: 100 kHz to 250 kHz 250 kHz to 650 kHz 550 kHz to 1.5 MHz 1.5 MHz to 4MHz 4 MHz to 11 MHz 10 MHz to 30 MHz
(9)	(Frequency dial)	Used to select desired output frequency. Mechanically ganged with the variable capacitor and pointer (11).
(10)	(Scale plate)	Graduated in six ranges to read output frequencies between 100 kHz and 30 MHz.
(11)	(Pointer)	Indicates scale settings.

REAR PANEL

(12)	EXT MOD INPUT	Input terminal for external modulation signals. To modulate the 2050 with an external modulation signal, feed a signal to this terminal and set MODULATION switch (3) to EXT. Usable modulating frequencies are between 50 Hz and 10 kHz.
(13)	GND	Grounding terminal for external modulation.
(14)	(Power cord)	Power supply cord.

OPERATING INSTRUCTIONS

1. Preliminary Setup. With power cord (14) connected to a power source, turn power switch (2) to ON. This turns neon lamp (1) on and places the signal generator in the operating condition. Allow 2 or 3 minutes warm-up for optimum frequency stability.

2. Selecting a Specific Frequency. To set to a specific frequency, select a proper range with FREQ. RANGE switch (8) and operate FREQUENCY dial (9) until its pointer (11) indicates the desired frequency on scale (10). The frequency dial is ganged with the variable capacitor.

For example, to set to 1 MHz:

Set FREQ. RANGE switch (8) to C, and pointer (11) to 1 MHz on scale (10).

3. Adjusting Output Voltage. Output voltage at output terminal (5) can be continuously adjusted from 0 to 0.1V rms by means of RF OUTPUT control (7). The RF OUTPUT control increases the output voltage when turned clockwise, up to 0.1V rms at the fully clockwise position if output attenuator (6) is at HIGH. When the attenuator is set to LOW, the output voltage is reduced to approximately 1/10 (−20 dB). When obtaining a small voltage, set the attenuator to LOW, since this makes adjustments easier at such small voltages.

4. Using the EXT MOD INPUT Terminal (Rear Panel). When connected to an external sine wave signal, this terminal enables the output voltage to be AM-modulated at a desired frequency between 50 Hz and 10 kHz, when the MODULATION switch (3) is at EXT. Required modulating voltage is approximately 1.5V rms for 40% modulation.

APPLICATIONS

The standard radio intermediate frequencies are as follows:

AM Broadcast IF	455 kHz
AM Broadcast IF,	262 kHz
FM Broadcast IF	10.7 MHz

In the applications of the 2050 described below, it is assumed that the broadcast receiver IF is 455 kHz, and the FM IF is 10.7 MHz.

Following are examples of how to use the B & K 2050 to check the frequency response of RF and IF amplifiers of AM receivers:

1. Aligning IF Transformers. Set the 2050 to 455 kHz, the intermediate frequency of the AM receiver to be aligned, and connect the 2050 to the base of Transistor Tr2, a mixer (See Fig. 2). The local oscillator must be kept inoperative during this adjustment. To make it inoperative, shunt the base of the local oscillator transistor or the tank circuit to ground.

Connect an output meter (or a VOM set to 2.5-10V DC range) to the emitter of Tr3, and measure the emitter voltage. This voltage, which is high when IFT1 is detuned, will drop as IFT1 is tuned to 455 kHz. IFT1 now is accurately tuned. Next, gradually change the frequency of the 2050 output to points above and below the 455 kHz point, to obtain a curve, as shown in Fig. 3. A detuning width between points that yield 3 dB difference in output as compared to the center frequency, is the passband of the IF transformer; the attenuation obtained when the IF transformer is detuned ±10 kHz from the center frequency, is the rated selectivity.

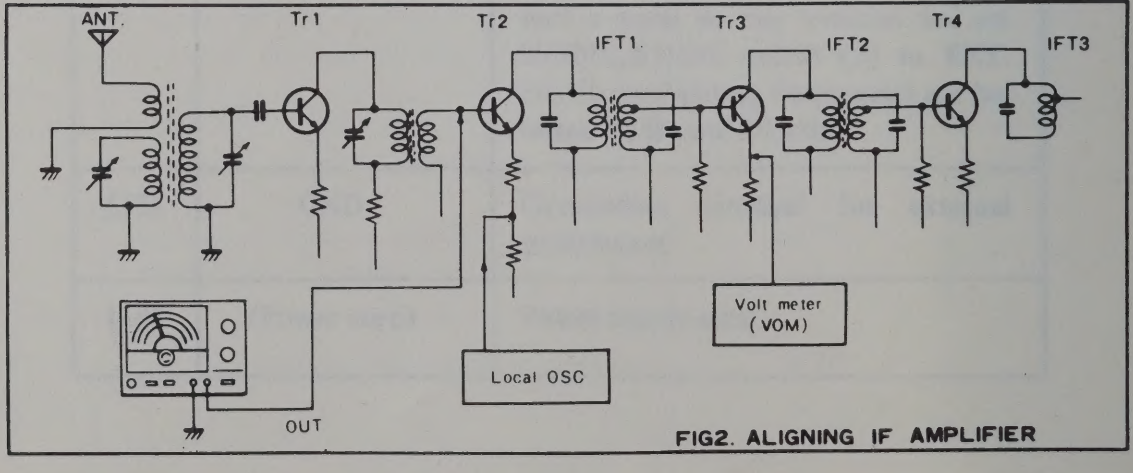


FIG2. ALIGNING IF AMPLIFIER

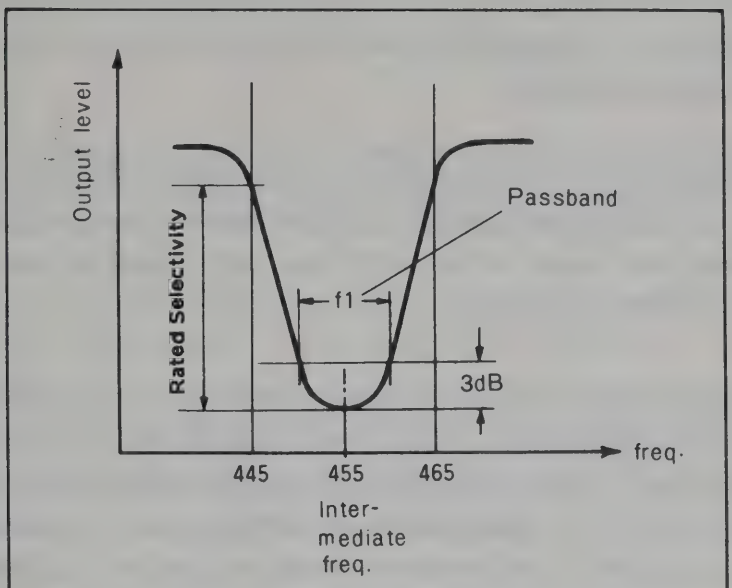


FIG3. SELECTIVITY

The frequency scale of the 2050 is marked with "▼" at 455 kHz and 10.7 MHz, for convenience in use.

In this way, the overall selectivity characteristic and gain of the IF amplifier can be determined by measuring IF transformers one by one.

When finding a maximum point on the AF output meter, set MODULATION switch (3) to INT and use a modulating output; or, set it to EXT if modulating externally. When utilizing the tuning meter or emitter voltage, the 2050 may be either modulated or unmodulated. When measuring the bandwidth of IFT's, however, an unmodulated signal is better, since it indicates their characteristics more faithfully.

2. Tracking. A test circuit for tracking is shown in Fig. 4. Tune the 2050 to the receiver frequency to be tested, and feed its output to the antenna circuit.

Three different frequencies generally are specified for this test:

Long Wave	Medium Wave	Short Wave
180 kHz	600 kHz	4.0 MHz
240 kHz	1000 kHz	7.0 MHz
320 kHz	1400 kHz	10.0 MHz

Measure and adjust the RF tuner and local oscillator frequencies using the above three testing frequencies. Couple the 2050 to the antenna terminal through a 100 pF capacitor. This capacitor serves as a dummy antenna, which minimizes the effects of generator loading on the tracking adjustments.

Adjust the receiver controls for maximum output when a 400 Hz, 40% internally modulated signal is supplied from the 2050. Practical receiver sensitivity is expressed in terms of a minimum input signal voltage which produces a signal-to-noise ratio (usually 20 dB) as measured at the audio output.

NOTE: The receiver being checked will produce an image signal in addition to its true signal because of its superheterodyne action. Such an image will be 910 kHz away from its true signal when the IF is 455 kHz, and in some receivers may appear nearly as strong as the true signal in short wave bands. The image frequency can be identified as follows: If the receiver local oscillator operates *below* the incoming carrier frequency, the image frequency appears at a point which is twice the IF *below* the carrier frequency to which the receiver is tuned. Conversely, if the receiver local oscillator operates *above* the incoming carrier frequency, the image appears at twice the intermediate frequency *above* the frequency to which the receiver is tuned.

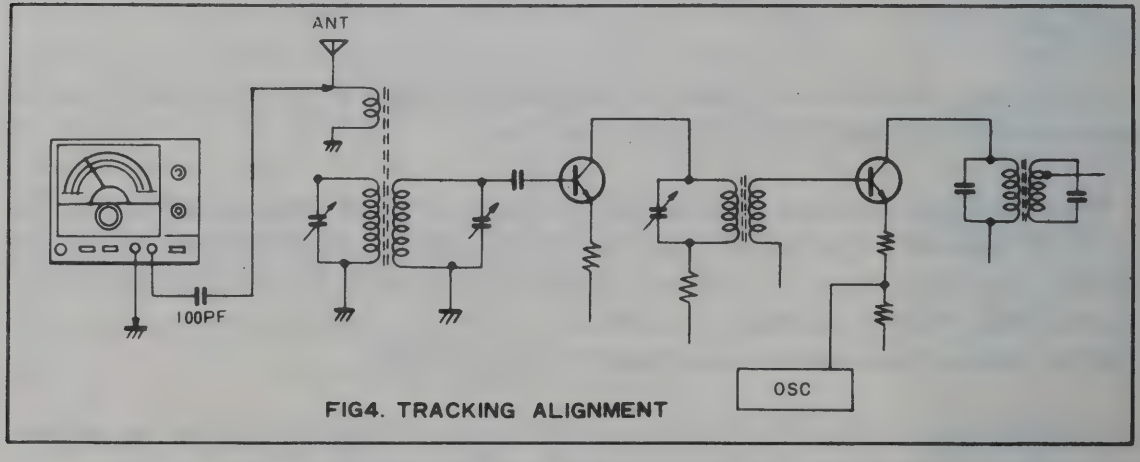


FIG4. TRACKING ALIGNMENT

MAINTENANCE

1. Removing the Cover. Remove the 3 screws on the left and right side plates, using a Phillips screwdriver. The cover can then be removed by lifting it up by the handle on the top, since the cover has only 3 sides–it has no face, back or bottom side.

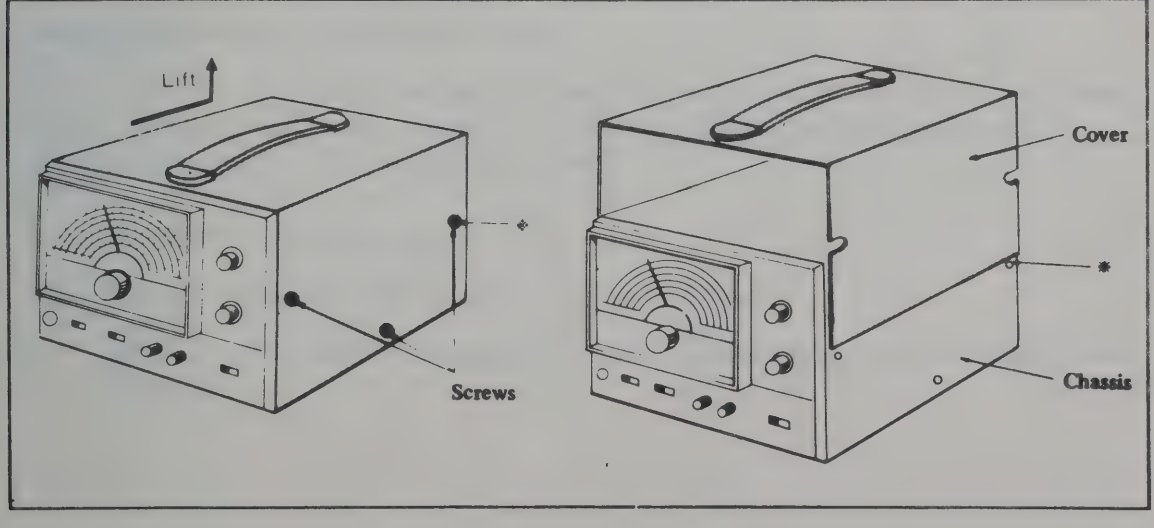
2. Replacing the Cover. To replace the cover on the chassis, loosely thread one screw on each side at the front end (marked * on drawing), before replacing the cover.

Next, place the cover on the chassis, starting at the front edges, making certain to fit the slots provided at the front edges of the cover in the center, on the (*) screws loosely attached beforehand to both left and right sides. Now press the cover down onto the chassis until it sets properly. (NOTE: In replacing the cover, exercise caution not to allow the front end of the case to strike the panel and cause damage.)

Next, fasten the left and right side plates of the cover to the chassis with the screws at the rear and bottom of each of the side plates.

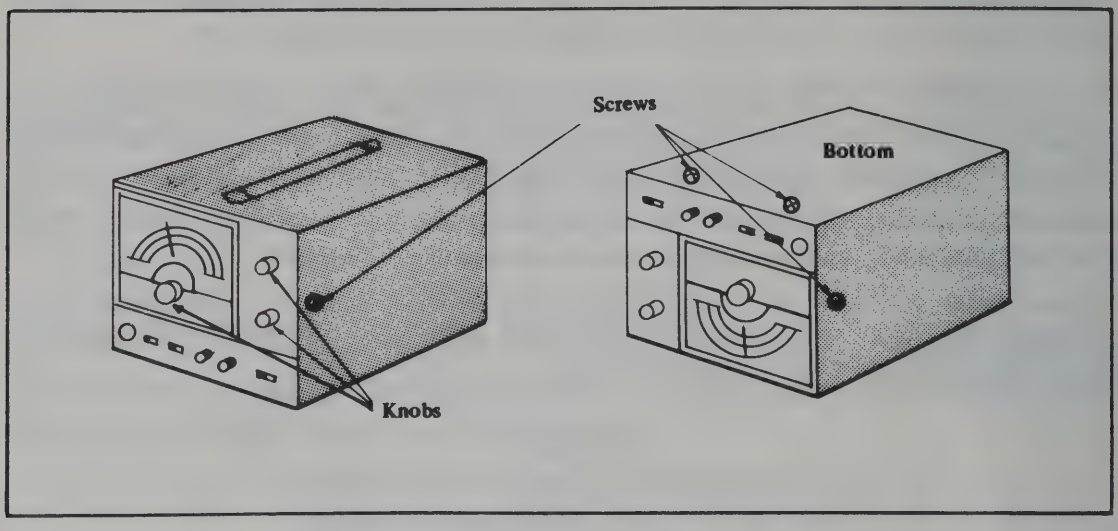
CAUTION

When removing the cover, be careful not to touch the internal printed circuit board or other parts. Also, always *disconnect the power cord,* because 117 V AC is present at the printed circuit boards.



3. Removing the Front Panel. To remove the front panel, loosen the set screws for the 3 knobs on the panel and remove the knobs. Then, loosen the 2 screws from the middle, at the left and right sides (these screws also fasten the cover to the case). Next, loosen the 2 set screws from the bottom of the panel.

Now hold the panel with both hands and pull it toward you; the panel will slide off the chassis. NOTE: When removing panel, pull it *gently,* taking care not to allow the panel to be caught by terminals, slide switches, neon lamp, etc.



ADJUSTMENTS

The Model 2050 signal generator is shipped completely factory-adjusted. Should readjustments become necessary, be sure to measure the power source voltage before adjustments are made. This should be 15 V, ± 1 V.

The test equipment to be used for calibration also should be calibrated.

Prior to adjustment, set the controls as follows unless otherwise noted:

(1) MODULATION (3) at CW

(2) OUTPUT ATT (6) at HIGH

(3) FREQ. RANGE (8) at C

(4) RF OUTPUT (7) at maximum output (fully clockwise position)

(5) FREQUENCY dial (9) at 1 MHz

Prior to proceeding with the adjustment, make DC voltage checks of all circuits to make sure they are operating normally.

1. Adjusting the Output Voltage

(1) Connect an RF voltmeter to output terminals (4) and (5).

(2) Adjust semi-fixed resistor VR2 until the RF voltmeter reads more than 0.1 V rms. (If an ordinary AC voltmeter is used as an alternative, use range "A" for a narrower frequency response.)

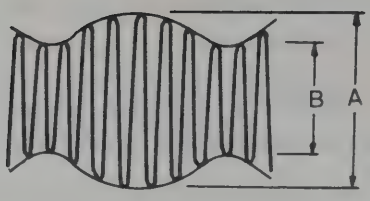
2. Adjusting Internal Modulation Percentage

If an oscilloscope is used, adjustment may be accomplished either with a wave-envelope pattern or with the trapezoidal pattern method. In either case, adjust at a frequency within range A of the signal generator.

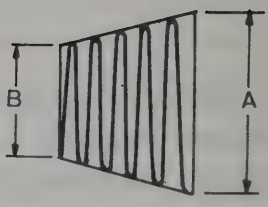
(1) Set MODULATION switch to INT.

(2) Connect an oscilloscope to output terminals (4) and (5).

(3) Adjust the semi-fixed resistor VR1 until approximately 40% modulation is obtained.



Wave Envelope Pattern Method



Trapezoidal Pattern Method

$$\% \text{ MOD} = \frac{A - B}{A + B} \times 100$$

3. Adjusting the Pointer

(1) Adjust the variable capacitor to provide a maximum value.

(2) Adjust the pointer to align with the index mark adjacent to the Band F letter.

4. Adjusting the Oscillation Frequency

(1) Connect a frequency counter to output terminals (4) and (5).

(2) Set the FREQUENCY RANGES to C and the pointer to 550 kHz. Confirm that the oscillation frequency is accurate to ±1.5% of 550 kHz. If not, adjust L3.

(3) Then, shift the pointer to 1.5 MHz and confirm that the oscillation frequency is 1.5 MHz, ±1.5%. If not, adjust trimmer TC1, located on the variable capacitor.

(4) Return the pointer to 550 kHz and reconfirm that the signal generator is oscillating at 550 kHz, ±1.5%. If there is a greater deviation, repeat adjustments (2) and (3) until the correct frequency is obtained.

(5) Calibrate the other ranges with the pointer set to the lowest frequency of the range. Adjust coil L1, for range A, coil L2 for range B, coil L4 for range D, coil L5 for range E and coil L6 for range F. Trimmer TC1, which has been adjusted under step (3), should not be touched again.

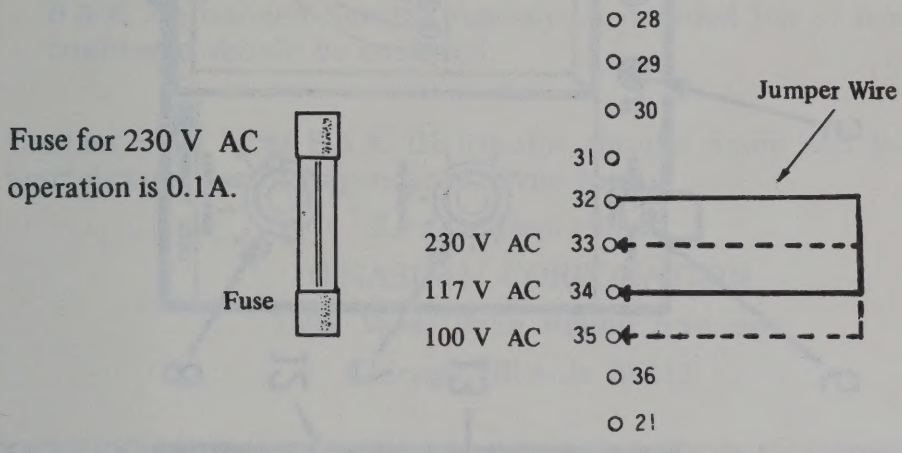
(6) Other intermediate scale graduations are calibrated automatically by the above adjustments.

PRECAUTIONS

1. Altering Power Transformer Primary. The primary power transformer can be altered for the various supply voltages.

Locate jumper lead connected to pin 32 on the printed circuit board. Connect opposite end of jumper wire as follows:

To Pin	For Supply Voltage
35	100 V AC
34	117 V AC
33	230 V AC



2. Warm-Up Period. Although the 2050 signal generator will begin operating as soon as power is applied, allow approximately 3 minutes for the circuits to warm up, to ensure accurate measurements.

3. Attenuation of Shielded Lead. Since the shielded lead has a capacitance of approximately 100 pF between the conductor and shield for every 3 ft. of length, output voltage will be attenuated. At 30 MHz, for example, this attenuation is 6 dB. If this attenuation must be reduced, use a separate, shorter lead to reduce the lead capacitance.

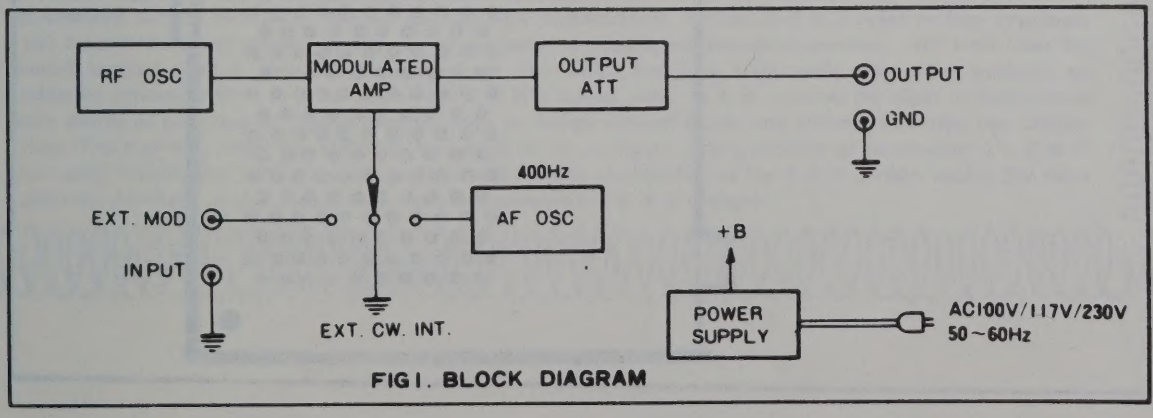
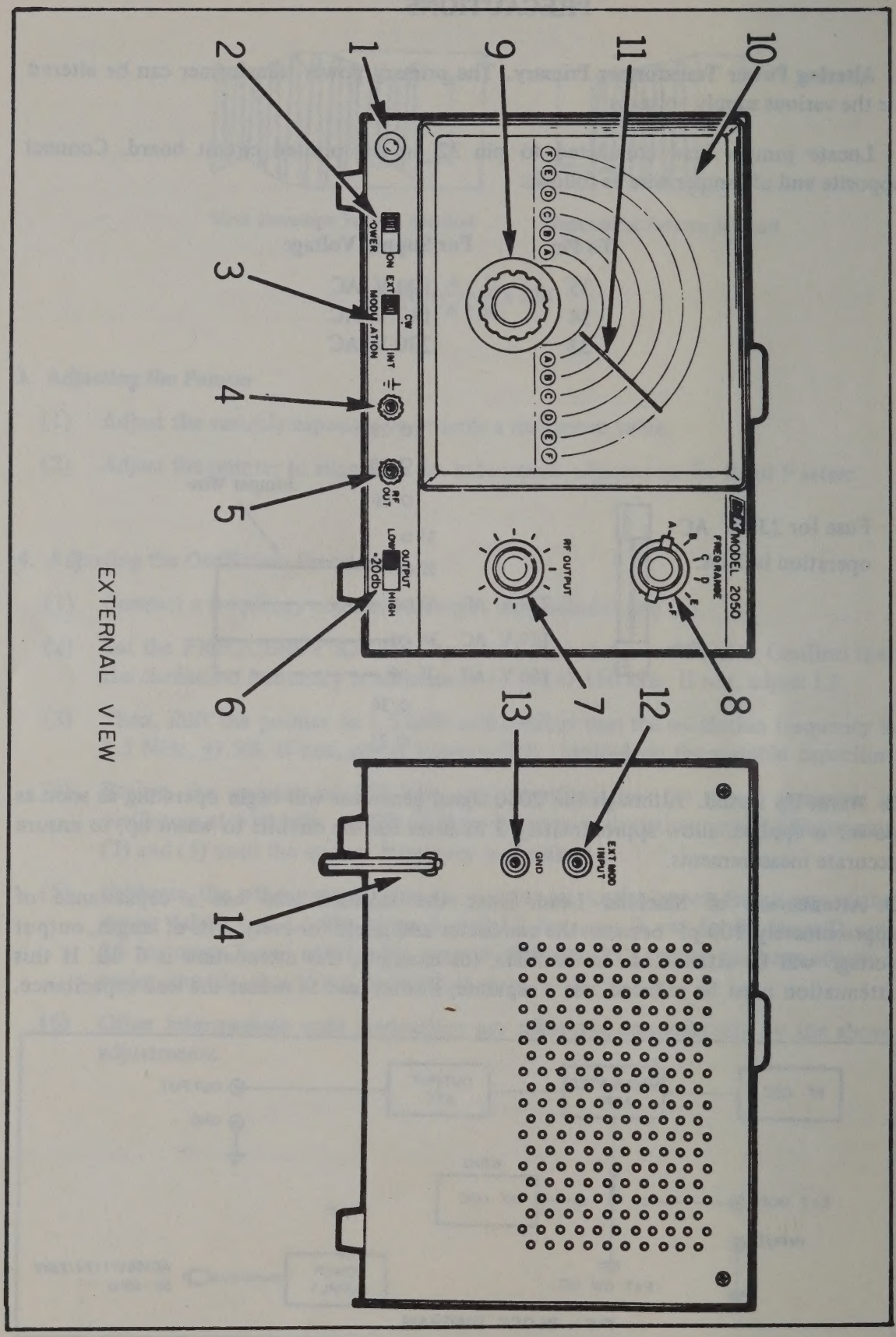


FIG 1. BLOCK DIAGRAM



EXTERNAL VIEW

WARRANTY/SERVICE INSTRUCTIONS

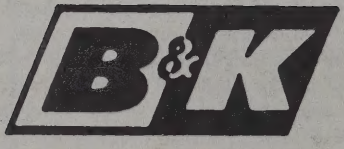
1. Refer to the maintenance section of the instruction manual for adjustments that may be applicable.
2. Check common electronic parts, such as transistors and batteries. Always check instruction manual for applicable adjustments after such replacement.
3. Defective parts removed from units under warranty should be returned to the factory, *prepaid*. The package should include the model number, serial number and date of product purchase. These parts will be exchanged at no charge.
4. If the above procedures do not correct the difficulty, pack the product securely (preferably in the original carton or double packed), forward it prepaid (express preferred) to your nearest B & K Authorized Service Agency. A detailed list of troubles encountered should be enclosed.

Contact your local B & K Distributor for the name and location of your nearest service agency, or write to:

Service Department
DYNASCAN CORPORATION
1801 West Belle Plaine Avenue
Chicago, Illinois 60613

WARRANTY

"B & K warrants that each product manufactured by it will be free from defects in material and workmanship under normal usage and service for a period of ninety days after its purchase new from an authorized B & K distributor. Our obligation under this warranty is limited to repairing, or replacing any product or component which we are satisfied does not conform with the foregoing warranty and which is returned to our factory or our authorized service contractor, transportation prepaid, and we shall not otherwise be liable for any damages, consequential or otherwise. *The foregoing warranty is exclusive and in lieu of all other warranties (including any warranty of merchantability), whether expressed or implied.* Such warranty shall not apply to any product or component (i) repaired or altered by anyone other than B & K or its authorized service contractor (except normal tube replacement) without B & K's prior written approval; (ii) tampered with or altered in any way or subjected to misuse, negligence or accident; (iii) which has the serial number altered, defaced or removed; or (iv) which has been improperly connected, installed or adjusted otherwise than in accordance with B & K's instructions. B & K reserves the right to discontinue any model at any time or change specifications or design without notice and without incurring any obligation. *The warranty shall be void and there shall be no warranty of any product or component if a B & K warranty registration card is not properly completed and postmarked to the B & K factory within five days after the purchase of the product new from an authorized B & K distributor.*"



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